



U.S. Department of Energy
Office of Inspector General
Office of Audit Services

Audit Report

System Development Activities at
Selected Management Contractors



Department of Energy

Washington, DC 20585

April 22, 2004

MEMORANDUM FOR THE SECRETARY

FROM:


Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Audit Report on "System Development Activities at Selected Management Contractors"

BACKGROUND

The Department of Energy relies extensively on information technology to manage its programs and functions. Systems and applications support virtually every aspect of the Department's diverse mission, covering activities ranging from business and financial processes to assuring the reliability of the Nation's nuclear stockpile. To place the magnitude of this effort in context, in Fiscal Year 2002, the Department expended \$2.3 billion on information technology, or about 11 percent of its overall budget. Of this amount, \$1.1 billion was specifically dedicated to resource development, modernization and enhancement.

Management contractors operate most of the Department's facilities and, as a consequence, manage the vast majority of its information technology investments. While these contractors are provided flexibility for determining business and management approaches, they have a basic requirement to ensure that system development activities are properly justified, well planned, and executed in a timely manner. As we noted in a series of information technology audit reports and as emphasized in our recent *Special Report on Management Challenges at the Department of Energy* (DOE/IG-0626, November 2003), duplicative development and planning problems have been observed in a number of organizations. Because of the importance of this issue, we initiated this audit to determine whether the Department's contractors were efficiently developing systems to meet mission needs.

RESULTS OF AUDIT

The Department's contractors were not always on track to deliver effective systems on time or at expected cost. We found indications of problems with systems being developed at all five of the major contractors included in our review. For example:

- Los Alamos National Laboratory's Enterprise Project development did not include critical mission elements and has been projected to cost about \$150 million, \$80 million more than initial estimates;



- Princeton Plasma Physics Laboratory's over-customization of its financial system contributed to schedule overruns of 19 months and rendered the system difficult to maintain and upgrade; and,
- Sandia National Laboratory expended about \$2.7 million on development of a stockpile reliability application, yet it is still uncertain as to the system's expected total cost.

The Department's contractors developed these systems without undertaking generally accepted systems development or project management practices. In many cases, they did not adequately justify the mission need or establish expected scope, cost, or schedule for such efforts. Further, the Department frequently did not provide appropriate guidance related to contractor systems development activities. As a result, there can be no assurance that the Department's system development efforts have been consistently managed in a cost effective manner nor that the promised results, which were cited to justify project resource commitments at the time of initiation, have been fully realized.

The Department has taken some positive steps towards improving monitoring and control of system development activities. For instance, the Chief Information Officer initiated a program to ensure Federal and contract managers are qualified for leading and/or overseeing information technology projects. While not yet implemented, the Department has also issued revised system development guidance to correct process shortcomings and incorporate regulatory changes. Furthermore, officials in the Offices of Chief Information Officer and Chief Financial Officer are developing methods for tracking information technology projects and performing periodic reviews to validate progress. While these are encouraging actions, we believe additional measures are warranted. Specifically, we made recommendations designed to aid the Department in improving the effectiveness of its information systems development projects and satisfying related President's Management Agenda initiatives related to electronic government.

MANAGEMENT REACTION

Management concurred with the report's findings and recommendations. Management agreed that improved oversight of contractor systems development efforts would lead to efficiencies and systems that better meet mission needs and indicated that it is in the process of updating and issuing guidance designed to address some of the issues highlighted in this report. Management's comments are included in Appendix 3.

Attachment

cc: Deputy Secretary
 Administrator, National Nuclear Security Administration
 Under Secretary for Energy, Science and Environment
 Assistant Secretary for Environmental Management
 Director, Office of Management, Budget and Evaluation/Chief Financial Officer
 Director, Office of Science
 Chief Information Officer

REPORT ON SYSTEM DEVELOPMENT ACTIVITIES AT SELECTED MANAGEMENT CONTRACTORS

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SYSTEM DEVELOPMENT ISSUES

System Cost, Schedule, and Scope

We evaluated systems under development at Los Alamos National Laboratory (Los Alamos), Sandia National Laboratory (Sandia), Fluor Hanford Incorporated, Bechtel National Incorporated, and Princeton Plasma Physics Laboratory (Princeton) from Fiscal Years (FY) 2001 through 2003. We identified a number of systems that were not on track to be delivered at expected cost, within schedule, or clearly meet mission critical needs. Specifically:

- In August 2001, Los Alamos decided to proceed with development of the Enterprise Project, a system designed to replace the Laboratory's accounting and management systems. The development effort was expected to cost about \$70 million and take 5 years. However, in January 2003, Los Alamos determined that essential components were missing from the planned system and that significant cost, schedule, and scope adjustments to the project would be necessary. The anticipated total project cost at that time was \$150 million, \$80 million over initial estimates. During our review, a Laboratory official indicated that the project has now been re-baselined for the second time and a specific determination as to overall project cost has not been completed.
- In July 2001, Princeton commenced its Business Information Systems Upgrade (BISU) project to replace its existing business system. It was initially projected to cost about \$2 million and was to be completed in October 2002. The project was based on commercial off-the-shelf software (COTS), but eventually 84 percent of the system's modules were customized to match existing business processes. These extensive modifications contributed to schedule overruns of about 19 months and required Princeton to supplement development efforts with its own staff. In addition, the resulting system will be difficult to maintain and upgrade.
- In July 2001, Sandia initiated work on the Neutron Generator Data Analysis System, an application designed to enhance data readability and assist in deciphering errors related to the nuclear stockpile. As of December 2003, Sandia had expended about \$2.7 million on system development, yet it is still uncertain as to the system's expected total cost. An official told us that while the Laboratory had established year-to-year plans and goals, they had not developed a means of controlling overall schedule

and cost throughout the project's lifecycle. Development continues with no expectation regarding its ultimate cost.

Further, because detailed expectations were never developed, we were not able to determine whether many of the systems projects met the contractors' most critical mission needs, were on schedule, or were developed within estimated cost.

Accepted System Development Practices

In many cases, the contractors that we reviewed did not employ generally accepted system development practices, and the Department did not monitor or provide adequate guidance to ensure that the contractors were doing so.

Contractor Practices and Department Monitoring

Contractors did not always properly plan and execute systems developments and Federal officials were not consistently monitoring site-level efforts. In particular, contractors did not always justify mission need and/or follow accepted practices when planning and executing developments. In certain instances, system development was not based on an approved business case, was undertaken without performing formal business process reengineering studies, and were never reviewed or approved by Departmental officials. In other cases, Federal officials did not take action to correct troubled or problematic system upgrades. For example:

- The Los Alamos decision to proceed with the development of the Enterprise Project was based on insufficient analyses and did not include critical mission needs related to manufacturing, safety, and security. The Laboratory was also not complying with the Department's project management requirements related to decision points, schedule, control, or performance management. Even though expected to cost about \$70 million and take 5 years to implement, the project was funded from overhead, not subjected to capital investment controls, and although Departmental officials were aware of the effort, it was never formally approved.
- Princeton's BISU project was based on a commercial-off-the-shelf product. Contrary to accepted development practice, the Laboratory permitted its development contractor to extensively modify the software package. Princeton officials told us that they initially embarked on the upgrade without completing formal business process reengineering studies because of assurances from the contractor that little customization would be required. As noted in Office of Management and Budget (OMB) Circular A-127 and as widely recognized by private

sector institutions such as Carnegie Mellon University's Software Engineering Institute, excessive customization negates the advantages of choosing a COTS solution, substantially increases the cost, and renders the system difficult to maintain and upgrade. Although Federal officials became aware of these problems, they did not require a business case justification and allowed the customization to proceed.

- Sandia developed the Neutron Generator Data Analysis System without completing a cost-benefit analysis and a comprehensive project plan – critical systems development lifecycle requirements. Sandia officials told us that while it had established year-to-year plans and goals, the Laboratory had not developed a means of controlling overall schedule and cost throughout the project's lifecycle. Federal officials were also not cognizant of this effort.

We also observed a number of projects that were initiated prior to the completion of necessary system development analyses and associated project planning requirements. For instance:

- Los Alamos development began on the Environmental Restoration Project Information System in May 2000 without analyses of cost/benefit and alternatives or a comprehensive project plan addressing anticipated cost.
- At Sandia, the Institutional Computing Cluster effort commenced in April 2003 without a project plan addressing overall cost.
- Bechtel National also began replacement of its Electronic Document Management System without benefit of an analysis of alternatives and initiated the Computerized Maintenance Management System effort in June 2002 omitting details related to project costs from the project plan.

Departmental Guidance

Lack of up-to-date system development guidance and inconsistencies within the Department's project management guidance contributed to many of the shortcomings in systems development. For example, as we reported in our audit of *Nuclear Materials Accounting Systems Modernization Initiative* (DOE/OIG-0556, June 2002), the Department's software development directive and guide were outdated and did not conform to current practices. The Department's software development requirements also omitted OMB requirements for preparation of business cases and do not address creation of the

National Nuclear Security Administration. While an "unofficial draft" of the guide was posted on the Chief Information Officer's web site, the Department has yet to formally update either the directive or the guide. In addition, applicability thresholds in the Department's project management order were inconsistent with the Department's internal threshold for systems development and OMB Circular A-11 requirements, even though this order extends planning, capital investment, and control requirements to information technology projects.

Program, site, and contractor officials indicated that these issues made them unsure of requirements and that they did not understand how investment policies applied to them. While some contractors developed their own procedures to address shortcomings or span incomplete Federal guidance, they usually were not applied, were generic in nature, or did not address legacy efforts. For example, Los Alamos approved a site-wide methodology in September 2003, but only recently initiated an effort to apply the requirements to problems with the Enterprise Project. Although Princeton had developed a methodology, it lacked specificity for guiding the effort in areas such as business process reengineering and piloting applications.

Cost Savings and Mission Accomplishment

Our evaluation of the results of their efforts disclosed that the Department's contractors did not consistently deliver effective systems on time or at expected cost. Further, unless, the underlying problems and root causes are addressed, the Department could incur more costs than necessary on system development and might not be able to carry out its missions as efficiently or effectively as possible. Given the Department's substantial investment in information technology a comprehensive effort to improve systems development practices is warranted.

RECOMMENDATIONS

To correct the specific issues noted in this report and improve overall information technology management, we recommend that the Administrator, National Nuclear Security Administration, the Assistant Secretary for Environmental Management, and the Director, Office of Science, in coordination with the Chief Information Officer, require organizations within their area of responsibility to:

1. Ensure that contractor development activities are well planned and satisfy OMB requirements for capital information technology (IT) investments;

-
2. Develop and incorporate specific IT development related performance measures into management contracts; and,
 3. Require site and program level officials to actively monitor contractor systems development and progress against established performance goals/milestones.

To improve, clarify, and consolidate planning, monitoring, and control of contractor system development activities, we recommend that the Chief Information Officer:

4. Complete revisions and publish directives and guidance for IT development in order to establish roles and responsibilities, incorporate OMB reporting thresholds and requirements, and resolve inconsistencies between related project management directives.

MANAGEMENT REACTION

The Chief Information Officer concurred with the report's findings and recommendations. The Chief Information Officer agreed that improved management and oversight of contractor systems development efforts would lead to reduced inefficiencies and systems that better meet mission needs. The Chief Information Officer also indicated that it is in the process of updating and issuing guidance designed to address some of the issues highlighted in this report. The Chief Information Officer did not agree that OMB guidance and the Department's policies conflict and believed that OMB had not established thresholds for IT reporting.

AUDITOR COMMENTS

Management comments are responsive to our recommendation. Based on these comments, we made several changes to the body of this report. In particular, modifications were made to recommendation four to delineate the program oversight and software quality issues we identified.

The inconsistency that we identified between current Department policies and OMB guidance related to reporting thresholds which are not contained in the Department's policies. OMB guidance for IT reporting clearly establishes a reporting threshold for financial systems costing more than \$500,000. However, the Department's project management directive does not require a business case or apply to systems costing under \$5 million. In addition, the Department's system

development directive does not have a reporting threshold and does not make specific reference to OMB guidance. Finally, the Chief Information Officer's comments reference an internal reporting threshold for IT projects of \$2 million; however, that requirement is not included in either the system development or project management directives.

Appendix 1

OBJECTIVE

To determine whether the Department's contractors were efficiently developing systems to meet mission needs.

SCOPE

The audit was performed between March 2003 and February 2004 at Headquarters; Los Alamos and Albuquerque, NM; Princeton, NJ; and Richland, WA. We evaluated whether the Department's contractors were employing sound system development methodologies.

METHODOLOGY

To accomplish our objective, we:

- Reviewed Federal regulations, such as OMB Circulars A-11, A-127, and A-130 Appendix III; Departmental Directives; and National Institute of Standards and Technology guidance pertaining to security planning;
- Reviewed relevant reports issued by the Office of Inspector General and the General Accounting Office;
- Held discussions with officials and staff at various organizations; and,
- Evaluated contractor and organizational system development and review methodologies and supporting documentation.

The audit was conducted in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Specific performance standards were largely not established for the area of information technology investment at the contractor level; therefore, we could not assess how they might have been used to measure performance. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We did not rely on computer-processed data to accomplish our audit objective.

An exit conference was held with appropriate Headquarters officials on April 13, 2004.

Appendix 2

PRIOR REPORTS

- *Electricity Transmission Scheduling at the Bonneville Power Administration* (DOE/IG-0637, February 2004). The Department's largest power marketing administration, Bonneville, relied primarily on its real-time operations dispatch and scheduling system (RODS), which was developed in the 1970's, to schedule transmission transactions across its grid. Bonneville initiated development of the Electricity Transaction Management System (ETMS) in 1999. However, ETMS cannot yet meet the need for rapid, reliable, and accurate electronic tagging and scheduling of a large volume of complex transmission transactions. Bonneville's management of the ETMS, a \$25 million effort, lacked a comprehensive project plan, and system development and implementation procedures.
- *Corporate and Stand-Alone Information Systems Development* (DOE/IG-0485, September 2000). Duplicative and/or redundant computer systems exist or are under development at virtually all organizational levels within the Department. Despite efforts to implement several corporate-level applications, many organizations continued to invest in custom or site-specific development efforts that duplicated corporate functionality. Programs, sites, and contractors have also developed a number of administrative and programmatic information systems that duplicate the functionality of systems in use by other Departmental elements.
- *Special Report: The Department of Energy's Implementation of the Clinger-Cohen Act of 1996* (DOE/IG-0507, June 2001). While the Department has taken action to address certain IT related management problems, it has not been completely successful in implementing the requirements of the Clinger-Cohen Act of 1996. The Department had not satisfied major requirements of the Act to develop and implement an integrated, enterprise-wide IT architecture, closely monitor policy implementation efforts, and acquire IT-related assets in an effective and efficient manner. Factors, such as a decentralized approach to IT management, the organizational placement of the CIO, and the lack of an IT baseline, may have contributed to these problems and impacted the Department's ability to satisfy Clinger-Cohen requirements.
- *Business Management Information System* (DOE/IG-0572, November 2002). The report concluded that the Department's Business Management Information System (BMIS) was unable to satisfy key Federal requirements and was not aligned with the Department's corporate IT architecture. Program elements were developing separate systems not capable of full integration with other business systems and not taking full advantage of existing components. BMIS did not link performance and financial data or replace certain inefficient financial management information systems.

Appendix 2 (continued)

- *Nuclear Materials Accounting Systems Modernization Initiative* (DOE/IG-0556, June 2002). The Department had not adequately managed its system redesign and modernization activities for nuclear materials accounting systems. Furthermore, planned and ongoing nuclear materials accounting systems development activity was not always consistent with the Corporate Systems Information Architecture. We recommended that the Department's CIO update the directive governing information management systems development.
- *Information System Development Practices at the Bonneville and Western Area Power Administrations* (DOE/IG-0586, February 2003). Information system development activities were not always consistent with Federal requirements or guidance. Certain development activities such as cost-benefit analyses, detailed gap analyses, separate billing systems, and inconsistent accounting for project costs resulted in schedule delays and cost overruns.
- *Special Report: Management Challenges at the Department of Energy* (DOE/IG-0626, November 2003). The most serious challenges facing the Department are Environmental Cleanup, National Security, Stockpile Stewardship, Contract Administration, Project Management, and Information Technology. For instance, internal control weaknesses relating to IT investments were still identified, leading to duplicative development, planning problems, and excessive cost in Department organizations.

Appendix 3



Department of Energy
Washington, DC 20585

March 31, 2004

MEMORANDUM FOR GREGORY FRIEDMAN
INSPECTOR GENERAL

FROM: ROSE PARKES *Rose Parkes*
CHIEF INFORMATION OFFICER

SUBJECT: Consolidated Comments on Draft Report on "System
Development Activities at Selected Management Contractors"

Attached is the Department's response to the Draft Inspector General Report, *System Development Activities at Selected Management Contractors*. We concur with the report's overall conclusion, but comment in our response on the accuracy and validity of several specific assertions made in the report.

The Department concurs with recommendations one through three in the draft report as written, but suggests rewording for recommendation four as follows: Complete revisions and publish the draft Order on *Information Technology Management*, O 200.1, in order to establish roles and responsibilities and resolve inconsistencies among related project management directives.

The Office of Chief Information Officer was the Primary lead program in the response to this report. Consolidated comments attached include responses from the Office of Environmental Management, the Office of Science, and the National Nuclear Security Administration. If possible, we would welcome the opportunity for our staffs to meet to discuss the accuracy of several assertions made in the report as well as the opportunity to collaborate on rewording the recommendations to more effectively address the problems cited in the report before it becomes final.

I appreciate the opportunity to review the report and to provide comments. If you have any questions, please contact me at (202) 586-0166 or Theanne Gordon, Deputy Associate CIO for IT Reform, at (202) 586-9958.

Attachment



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Appendix 3 (continued)

Consolidated Comments on Draft Audit Report System Development Activities at Selected Management Contractors

The Office of the Chief Information Officer, the Office of Environmental Management, the Office of Science, and the National Nuclear Security Administration were asked to review and comment on the draft Office of Inspector General (IG) audit report entitled, *System Development Activities at Selected Management Contractors*. The Office of Science concurred without comment. Comments below and proposed changes to the recommendations in the draft report were provided by the Office of the Chief Information Officer and the Office of Environmental Management.

In reviewing the draft report, some factual errors were noted. In the memorandum for the Secretary from Gregory Friedman it states, "During Fiscal Year 2002, the Department expended over 11 percent of its overall budget or \$2.5 billion on information technology..." Based on the Budget Year (BY) 2004 Exhibit 53 submitted to the Office of Management and Budget (OMB) in January 2003, the Fiscal Year (FY) 2002 total IT expenditures were \$2.278 billion.

Also, in the report section on Monitoring and Control, paragraph two, the report states, "While the Department's project management order extends planning, capital investment, and control requirements to information technology projects, applicability thresholds conflict with OMB Circular A-11 requirements." In fact, OMB Circular A-11 does not establish thresholds for IT reporting. The Department has established an internal threshold of \$2 million in one year a one element of a multi-part definition of a major IT investment, but this is not a Circular A-11 requirement.

The Department agrees with the draft report that improved management and oversight of management contractor system development efforts would lead to reduced inefficiencies and systems that better meet mission needs. In addition we concur with the position that IT system development performance measurement and tracking should be integrated into future performance-based contracts.

The Department disagrees with the assertion in the draft report that OMB and DOE policies and guidance documents conflict. While it may be true that some field elements and management contractors require more direction from Headquarters Program Offices on how to apply existing policies or to respond to calls for information, this is not due to conflicting requirements.

RECOMMENDATIONS

To correct the specific issues noted in this report and improve overall information technology management, we recommend that the Assistant Secretary for Environment, the Administrator, National Nuclear Security Administration, the Director, Office of Science, in coordination with the Chief Information Officer, require organizations within their area of responsibility to:

Appendix 3 (continued)

Recommendation 1: Ensure that contractor development activities are well-planned and satisfy Office of Management and Budget requirements for capital information technology investments.

Response: Concur

Recommendation 2: Develop and incorporate specific information technology development related performance measures into management contracts.

Response: Concur

Recommendation 3: Require site and program level officials to actively monitor contractor systems development and progress against established performance goals/milestones.

Response: Concur

To improve, clarify, and consolidate planning, monitoring, and control of contractor system development activities, we recommend that the Chief Information Officer:

Recommendation 4: Complete revisions to software development policy and resolve inconsistencies between related project management directives.

Response: Concur in principle, but non-concur on approach.

Suggest rewording recommendation to state: Complete revisions and publish the draft Order on *Information Technology Management*, O 200.1, in order to establish roles and responsibilities and resolve inconsistencies among related project management directives.

Benefits of this Approach:

The draft Notice 203.1, *Software Quality Assurance*, is limited in scope to system development lifecycle guidance in order to ensure software quality. The issues identified in this draft report are broader in scope and relate to program oversight issues as well as software quality issues. Draft order 200.1 addresses roles and responsibilities in all these areas. The OCIO is in the process of publishing this draft order and expects to have it announced through the DOE directives system by the end of FY 2004.

Appendix 3 (continued)

Specific Comments Provided by Contributing Offices

Office of Science

The Office of Science has no comments on the subject report [IG Draft Report on “System Development Activities at Selected Management Contractors”.]

Office of Environmental Management

No comments provided.

National Nuclear Security Administration

No comments on the subject report [IG Draft Report on “System Development Activities at Selected Management Contractors”.]

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3. What format, stylistic, or organizational changes might have made this report's overall message more clear to the reader?
4. What additional actions could the Office of Inspector General have taken on the issues discussed in this report which would have been helpful?

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